

Remarks

In the Office Action of October 20, 2005, the Examiner rejected claims 1-8 under 35 U.S.C. § 112, first paragraph; rejected claims 1-28 under 35 U.S.C. § 112, second paragraph; and rejected claims 1-29 under 35 U.S.C. § 103(a) based on U.S. Patent No. 5,485,586 to Brash et al. ("Brash"), U.S. Patent 6,286,068 to Arimilli et al. ("Arimilli"), and U.S. Publication No. 2003/0135537 to Mikael et al. ("Mikael").

By this Amendment, Applicants have amended claims 1, 3, 7, 9, 13, 17, 19, 22, 24, and 28 to improve form. Additionally, claims 5, 6, and 26 have been canceled without prejudice or disclaimer.

Rejections Under 35 U.S.C. § 112, First Paragraph

The Examiner contends that the previous amendment introduced language in claims 1-8 that was not described in the originally filed specification. (Office Action, page 2). More specifically, the Examiner contends that the recitations relating to "simultaneous" arbitration by the plurality of arbiters does not comply with the written description requirement of 35 U.S.C. § 112, first paragraph, as simultaneously arbitrating is not disclosed in the originally filed specification.

Applicants disagree with the Examiner's interpretation of Applicants' specification. Applicants' specification clearly describes the simultaneous operation of a plurality of arbiters. Paragraph 0036, for example, states that "it is desirable for arbiter 310 to simultaneously implement both DQ arbitration and

RED arbitration.” (emphasis added). Further, the description of arbitration system 400 in paragraphs 0037 through 0041, although it doesn’t explicitly use the word “simultaneous,” clearly describes simultaneous operation of arbiters. Applicants particularly draw the Examiner’s attention to, for example, portions of paragraph 0039 (“if DQ [arbiter] 401 attempts to access a queue that is already being accessed by RED arbiter 402”) and portions of paragraph 0041 (“conflict may occur if DQ arbiter 401 attempts to access a queue while RED arbiter 402 has already started a queue access”). These sections of the originally filed specification clearly describe arbiters that simultaneously arbitrate among common elements of a resource, as recited in claim 1.

For at least these reasons, the rejections of claim 1-8 under 35 U.S.C. § 112, first paragraph, should be withdrawn.

Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1-28 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. According to the Examiner, the claims’ recitations relating to a “predetermined point in its processing” (claims 5, 7) and “predetermined commit point” (claims 9, 17, 22, and 28) are indefinite “because it is unclear what kind of predetermined point it is.” (Office Action, page 3).

As an initial matter, it appears to Applicants that although the Examiner rejected claims 1-28 in the statement of the rejection, it appears that only claims 5, 7, 9, 17, 22, and 28, and the claims that depend therefrom, included the

language that the Examiner found indefinite. Thus, the rejection of claims 1-4 was not proper.

In any event, although Applicants do not agree with the rejection under 35 U.S.C. § 112, second paragraph, in order to expedite prosecution, Applicants submit that claims 1-4, 7-25, 27, and 28, as amended, are clear and definite. Accordingly, the rejection under 35 U.S.C. § 112, second paragraph, should be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Claims 1-29 stand rejected under 35 U.S.C. § 103(a) in view of Brash, Arimilli, and Mikael. For the following reasons, Applicants respectfully traverse this rejection.

Independent claim 1, as amended, is directed to a system including a plurality of arbiters and conflict logic. The plurality of arbiters each simultaneously arbitrate among common elements of a resource and each being implemented as a series of pipeline stages. The conflict logic detects conflicts among the plurality of arbiters accessing the elements of the resource, and, when a conflict is detected, the conflict logic is configured to alter processing relating to the conflict in one of the conflicting arbiters, when the processing relating to the conflict has not passed a predetermined stage in the pipeline corresponding to the one of the conflicting arbiters.

Applicants submit that Brash, Arimilli, and Mikael, even if combined as the Examiner suggests, still do not disclose or suggest each of the features recited in

amended claim 1. Neither Brash, Arimilli, nor Mikael, for instance, discloses or suggests the plurality of arbiters recited in claim 1 in which conflict logic detects conflicts among the plurality of arbiters accessing the elements of the resource. The Examiner appears to contend that Brash discloses a plurality of arbiters and conflict logic. (Office Action, page 4). However, the Examiner concedes that Brash does not explicitly mention “alter[ing] processing relating to the conflict in the one of the conflicting arbiters.” (Id.).

Brash is directed to a queue-based arbiter that arbitrates between N devices of a computer system. (Brash, Abstract). The N devices in Brash are system devices in a computer system that communicate over a bus. (Id.). The arbiter of Brash is said “to provide fair access to the bus by maintaining a queue of requests that come in from each resource in the computer system.” (Id.). In Fig. 6, Brash discloses an arbiter that can “support a hierarchical, two priority level scheme.” (Brash, col. 7, lines 53 and 54). The arbiter shown in Fig. 6 of Brash includes a low priority section 252, a high priority section 254 and a grant control logic section 256. (Id., col. 7, lines 55-57). Low priority section 252 is coupled to low priority request lines and high priority section 254 is coupled to high priority request lines. (Id., col. 7, lines 57-61). The grant control logic section 256 of Brash is described as controlling “whether the low priority section 252 or the high priority section 254 can grant access to the bus 30.” (Brash, col. 8, lines 17-20).

Applicants submit that the arbiter shown in Fig. 6 of Brash is a single arbiter that includes multiple sections, not a plurality of arbiters, as recited in

claim 1. Brash clearly describes the arbiter shown in Fig. 6 (arbiter 250) as a single arbiter: "As shown, the arbiter 250 comprises a low priority section 252, a high priority section 254" (Brash, col. 7, lines 55-57). (Emphasis added). Further, even if one were to assume that sections 252 and 254 of arbiter 250 were separate arbiters (a point Applicants do not concede), these sections do not "each simultaneously arbitrate among common elements of a resource," as is also recited in amended claim 1. Instead, as is clearly described in column 7 of Brash, sections 252 and 254 of arbiter 250 each receive and arbitrate among different request lines; they do not arbitrate among common elements of a resource. (See Brash, column 7, lines 58-61; in which Brash describes the low priority request lines being coupled to section 252 and the high priority request lines being coupled to section 254).

Amended claim 1 further recites "conflict logic configured to detect conflicts among the plurality of arbiters accessing the elements of the resource." Brash does not disclose or suggest any such conflict logic. The Examiner appears to contend that grant control logic 256 of Brash corresponds to the conflict logic recited in claim 1. Grant control logic 256 of Brash switches between low priority section 252 and high priority section 254, but does not detect conflicts among the plurality of arbiters. As previously mentioned, low priority section 252 and high priority section 254 receive and arbitrate among different lines and, thus, there could not possibly be any conflicts among sections 252 and 254 of Brash in accessing the elements of a resource, as recited in claim 1, and there would certainly be no need for conflict logic that detects

conflicts among a plurality of arbiters, as recited in claim 1. It appears to Applicants that the Examiner may be confusing the well known function of arbiters in resolving (arbitrating) conflicts for resources, and the conflict logic recited in claim 1, which detects conflicts among a plurality of arbiters.

Neither Arimilli nor Mikael cure the above-noted deficiencies of Brash. Arimilli is directed to a queued arbitration mechanism for a data processing system. (Arimilli, Title). The Examiner appears to be relying on Arimilli for the disclosure of a pipelined arbiter. (Office Action, page 5). Applicants have reviewed Arimilli and submit that Arimilli in no way discloses or suggests the above-discussed deficiencies of Brash. Mikael is directed to a semaphore system that arbitrates for multiple processes that may request access to a given shared resource. (Mikael, Abstract). Although Mikael may be said to disclose multiple local arbiters 402 that each arbitrate on behalf of a separate process 302 and 304 (Mikael, Fig. 4), nothing in Mikael discloses or suggests "conflict logic configured to detect conflicts among the plurality of arbiters accessing the elements of the resource," as is recited in claim 1. Accordingly, Applicants submit that neither Brash, Arimilli, nor Mikael, either alone or in combination, discloses or suggests each of the features recited in claim 1.

Claim 1, as amended, further recites that the conflict logic, when a conflict is detected, "alter[s] processing relating to the conflict in one of the conflicting arbiters when the processing relating to the conflict has not passed a predetermined stage in the pipeline corresponding to the one of the conflicting arbiters." The Examiner concedes that Brash does not mention "alter[ing]

processing relating to the conflict in one of the conflicting arbiters,” but contends that this would have been an obvious modification of Brash to one of ordinary skill in the art because “‘alter processing’ would have been obviously the same of ‘switching between the two priority sessions.’” (Office Action, page 4).

Applicants respectfully disagree with the Examiner’s conclusion of obviousness, as altering processing in one of the conflicting arbiters when the processing relating to the conflict has not passed a predetermined stage in the pipeline corresponding to the one of the conflicting arbiters, as is recited in amended claim 1, is clearly different than Brash’s disclosure of using grant control logic 256 to control whether low priority section 252 or high priority section 254 can grant access to a bus. (Brash, col. 8, lines 15-19). One of ordinary skill in the art, upon reading Brash, would not be motivated to modify Brash as the Examiner suggests. The Examiner’s given motivation for modifying Brash is conclusory and appears to be improperly based on hindsight gleaned from Applicants’ specification.

Applicants note that amended claim 1 now recites that the plurality of arbiters are each implemented as a series of pipeline stages. The Examiner appears to rely on Arimilli for the disclosure of a pipelined arbiter. Even assuming for the sake of argument that Arimilli discloses a pipelined arbiter, nothing in Arimilli or Brash reasonably suggests why one of ordinary skill in the art would first modify Brash to include a pipelined arbiter and then modify Brash to alter processing in a conflicting arbiter based on the specific conditions recited in claim 1. That is, nothing in Arimilli or Brash suggests altering processing in a

conflicting arbiter when the processing relating to the conflict has not passed a predetermined stage in the pipeline corresponding to the one of the conflicting arbiters, as recited in claim 1.

For at least these reasons, Applicants submit that Brash, Arimilli, and Mikael, either alone or in combination, do not disclose or suggest the features of amended claim 1 and the rejection of this claim should therefore be withdrawn. The rejections of claims 2-4, 7, and 8 should also be withdrawn, at least by virtue of the dependency of these claims from claim 1. Further, these claims recite additional features not disclosed or suggested by Brash, Arimilli, and Mikael.

For example, claim 4 recites that the first arbiter arbitrates based on flow control and the second arbiter arbitrates to manage congestion of the elements in the resource, where the first arbiter having a higher priority than the second arbiter. Brash, Arimilli, and Mikael do not disclose this feature of the invention. As noted by the Examiner, Brash discloses arbitrating between higher and lower priority requests. Arbitrating based on different priorities, however, cannot reasonably be said to disclose or suggest a first arbiter that arbitrates based on flow control and a second arbiter that arbitrates to manage congestion. Accordingly, for this reason also, Applicants submit that the rejection of claim 4 is improper and should be withdrawn.

In the previous response, Applicants also presented the above-arguments regarding claim 4. The Examiner did not address these arguments in the Office Action. Applicants request that the Examiner address these arguments or withdraw the rejection.

Claim 7 further defines the features of claim 1 and recites logic configured to, when the conflict logic detects a conflict between the plurality of arbiters and the one of the conflicting arbiters has passed the predetermined stage, modify the element associated with the conflict such that the higher priority arbiter is immediately able to access a next data element in the resource. Brash, Arimilli, and Mikael do not disclose this feature of the invention and the Examiner does not specifically address this feature of the invention. If the Examiner persists with this rejection, Applicants request that the Examiner specifically address this feature.

Claims 9-27 also stand rejected under 35 U.S.C. § 103(a) based on Brash, Arimilli, and Mikael. In rejecting these claims, the Examiner states that these claims “are of similar scope as of claims 1-8, and therefore claims 9-27 are rejected for the same reasons.” (Office Action, page 5). Applicants disagree with the Examiner’s interpretation of claims 9-27. These claims recite features that are not necessarily identical or similar to those recited in claims 1-4, 7, and 8. Applicants request that, if the Examiner continues to reject these claims, that the Examiner specifically address the features recited in these claims in any subsequent Office Action.

Applicants submit that Brash, Arimilli, and Mikael, either alone or in combination, do not disclose or suggest the features of amended independent claim 9. As discussed above, Brash does not disclose or suggest, as is recited in claim 9, examining a plurality of arbiters for conflicts among the plurality of arbiters in arbitrating a plurality of queues. Neither Arimilli nor Mikael cures this

deficiency of Brash. Further, neither Brash, Arimilli, nor Mikael, either alone or in combination, discloses or suggests determining, when conflicts occur in arbitrating the plurality of queues, whether one of the conflicting arbiters has reached an arbitration point beyond a predetermined commit point defined as a predetermined arbitration stage in the plurality of sequential arbitration stages, as is recited in claim 9.

Further, claim 9 further recites “invalidating processing in the one arbiter related to the conflict when the one arbiter is not beyond the commit point.” Neither Brash, Arimilli, nor Mikael, either alone or in combination, discloses or suggests any such feature. In rejecting claim 1, the Examiner seems to state that the disclosure of Brash relating to allowing only a single grant to issue at any instant of time somehow relates to “altering processing.” (Office Action, page 4). Applicants submit that claim 9 recites significantly more than simply altering processing in an arbiter. Specifically, claim 9 recites, for example, invalidating processing in the one arbiter related to the conflict when the one arbiter is not beyond the commit point. Applicants submit that Brash completely fails to disclose or suggest this aspect of the invention. Brash does not disclose invalidating processing in an arbiter, nor does Brash disclose taking an action when an arbiter is not beyond a commit point. Arimilli and Mikael do not cure this deficiency of Brash.

For at least these reasons, Applicants submit that Brash, Arimilli, and Mikael do not disclose or suggest the features of claim 9 and the rejection of this claim should therefore be withdrawn. The rejections of claim 10-16, at least by

virtue of their dependency on claim 9, should also be withdrawn. Further, these claims recite additional features not disclosed or suggested by Brash, Arimilli, and Mikael.

Claim 10, for example, further defines the features of claim 9 and recites modifying the queue associated with the conflict so that a next data item in the queue is advanced to a head position in the queue when the lower priority arbiter is beyond the commit point. Applicants submit that Brash, Arimilli, and Mikael completely fails to disclose or suggest this feature of the invention.

Independent claim 17 and its dependent claims 18-21 also stand rejected based on Brash, Arimilli, and Mikael. Based on rationale similar to that given above, Applicants submit that the applied references do not disclose or suggest a number of the features recited in claim 17. For example, Brash, Arimilli, and Mikael, either alone or in combination, do not disclose or suggest the first arbiter and second arbiters recited in claim 17. Brash, Arimilli, and Mikael also do not disclose or suggest conflict detection logic detecting conflicts between the first and second arbiters in arbitrating the plurality of queues.

For at least these reasons, Applicants submit that Brash, Arimilli, and Mikael do not disclose or suggest the features of claim 17 and the rejection of this claim should therefore be withdrawn. The rejections of claim 18-21, at least by virtue of their dependency on claim 17, should also be withdrawn.

Independent claim 22 and its dependent claims 23-27 were also rejected based on Brash, Arimilli, and Mikael. These references do not disclose or suggest the features recited in amended claim 22. Brash, Arimilli, and Mikael, for

example, do not disclose or suggest a plurality of processing elements including a plurality of arbiters and the conflict logic recited in claim 22. For reasons similar to those given above, Applicants submit that Brash, Arimilli, and Mikael, either alone or in combination, do not disclose or suggest each of the features recited in claim 22, such as the recited plurality of arbiters and the conflict logic. Accordingly, the rejection of claim 22 is improper and should be withdrawn. At least by virtue of their dependency on claim 22, the rejections of dependent claims 23-25 and 27 are also improper and should be withdrawn.

Regarding claims 28 and 29, Applicants note that although the Examiner includes these claims in the initial statement of the rejection under 35 U.S.C. § 103(a) on page 4 of the Office Action, the Examiner does not explicitly address these claims in the substantive statement of the rejection. Applicants request clarification on the status of these claims.

In any event, Applicants submit that Brash, Arimilli, and Mikael, either alone or in combination, do not disclose or suggest each feature of amended independent claim 28 or its dependent claim 29. Accordingly, the rejection of these claims should also be withdrawn.

Amended claim 28 includes, for example, means for detecting conflicts among a plurality of arbiters that arbitrate among a plurality of queues, each of the plurality of arbiters being implemented as a series of pipeline stages. Brash, Arimilli, and Mikael, either alone or in combination, do not disclose or suggest this feature of claim 28. Claim 28 further recites means for determining, when conflicts are detected by the means for detecting, whether one of the conflicting

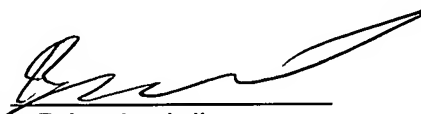
arbiters has reached an arbitration point beyond a predetermined commit point, defined by a predetermined stage in the series of pipeline stages of the one of the conflicting arbiter; and means for invalidating processing relating to the conflict in the one arbiter when the one arbiter is not beyond the commit point. Brash, Arimilli, and Mikael, either alone or in combination, also do not disclose or suggest either of these features of claim 28.

In view of the foregoing amendments and remarks, Applicants respectfully request withdrawal of the outstanding rejections and the timely allowance of this application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 50-1070 and please credit any excess fees to such deposit account.

Respectfully submitted,

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